QUICK-ACTING TOOLS

A Story of Some Screw Driver and Drill Specialties, from Inventor's Brain to Mechanic's Hand

By John Morlew

In these days when all are looking for labor-saving tools it is interesting to make a little journey to the birthplace of a line embracing everything which modern industry and use requires for the boring of wood and metal and for the driving and drawing of screws. It is hard to conceive of a foundry, a factory, and industrial enterprise of any kind or a home, where tools of this nature are used, or of a mechanic or householder who does not need them, and need them often.

Tools are Put Together by Machines Exerting a Tremendous Pressure

This birthplace that is to be the scene of a hurried visit is the factory of the North Brothers Manufacturing Company, in Philadelphia, Pennsylvania. The extremes of their line of tools, known in the trade as the "Yankee" line are the plain, rigid screw-driver, whose one essential is that the blade shall not turn in the handle, to the bench drill with its automatic friction and ratchet feeds that leave one hand of the operator free to hold the piece of work. There are plain screw drivers, in all sizes, ratchet drivers with and without magazines for blades; spiral ratchet drivers, equipped for chucks with drill points, for bits with screw and screw-eye holders, for every possible use to which a screw driver can be put. There are push braces, automatic push drills with adjustable tension reciprocating drills, breast and hand drills. These latter have right, left and continuous ratchet movements, two or three jaw chucks, single and double speeds. There is a positively uncanny facility for going in anywhere and under any condition to do an appointed task—amid the complicated and queerly huddled mechanisms of the automobile; between flywheel spokes in the engine room; in acute corners, where only the smallest fractional movement of the hand can find space for play. Overhead, where the workman would ordinarily have to get a ladder, the wielder of one of these time and labor-saving tools need only reach up with one hand and push. The very chain drills can be adjusted to their jobs in a moment by means of a friction feed; and when the chain is tight, the automatic ratchet feed comes into operation—positive, fixed and with entire safety for the drills.

Long Rows of Experts do Nothing But Test Screw Driver Blades

The hardware man, be he jobber, wholesaler or retailer, will have an understanding of the particular type and purpose of every tool that has been mentioned, but perhaps, to the tool user, be he professional mechanic or amateur householder, some of the terms may give but a vague impression of just what the tool is, and wherein lies its efficiency. For this reason it may be well to attempt a few definitions, or rather to briefly describe just the sort of a tool covered by each of the terms used.

Now every one knows what is meant by a plain screw driver. The statement that it is merely a highly polished and properly tempered steel blade, securely fastened in a wooden handle so that blade and handle cannot work loose in driving or drawing screws, is merely made to give logical sequence to the story.

The ratchet screw driver is, as the name implies, a tool with a ratchet in the handle and compared with the ordinary screw driver it saves labor, saves time, works easier and is far more convenient. Once the bit has been placed in the slot in the screw it is only necessary in driving or drawing the screw, to turn the driver as far as the wrist will permit, turn it in a backward movement, again turn it forward as far as the wrist will allow, and repeat this simple movement until the screw is driven or drawn. The movement is something like that of winding a "stem-winder" watch. Anyone who has had occasion to drive screws will at once recognize the advantages of such a tool over the ordinary driver, in using which a fresh grip has to be taken with every turn. There is a variation of this ratchet type which is known as the magazine ratchet screw driver. The special feature of this tool is that, in place of a single blade which is a permanent part of the driver, there are four easily removable and interchangeable blades, all but the one in use being stored in a magazine in the handle. These four blades vary to suit different sizes of screws, and consequently the one driver practically does the work of four.

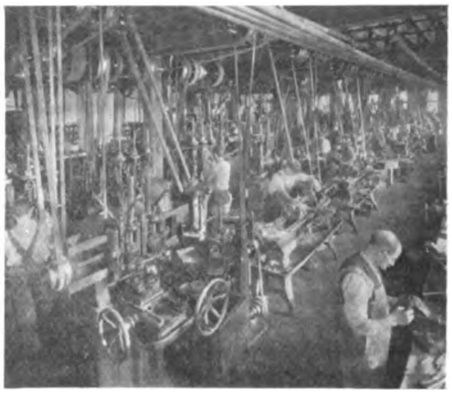
Chucks for Breast Drills are Trued on Machines Built in the Shops

The spiral ratchet screw driver is a more highly developed tool than the plain ratchet screw driver, though the gap between them is not as great as that between the latter and the plain screw driver. The feature of this spiral type is that screws are driven or drawn simply by pushing on the handle, no turning whatsoever is necessary. The spindle of this screw driver has two spirals, one right and one left hand, with corresponding nuts; to drive screws in, the shifter is moved to the end of the slot near the bit; to draw screws out, it is moved to the end of the slot toward the handle. The mechanism of this is such that it can be used also either as a plain ratchet screw driver or as an ordinary rigid screw driver. Screws can be ratcheted in or out by turning the handle as in a ratchet screw driver— setting shifter same as for pushing screws in or out, with the tool closed up and locked by turning a milled collar in front of the shifter case a quarter of a turn. When closed and locked, with shifter midway between the ends of the slot, the tool becomes rigid or as an ordinary screw driver. Each spiral driver is furnished with three bits of different widths and thickness, thus enabling one tool to do the work of three.

The push brace is so named because it will hold all the small tools used in a bit brace, but is operated by pushing the handle to revolve the tools, in the same manner as a spiral ratchet screw driver. Its advantage is the great rapidity and convenience in the lighter work ordinarily done by a bit brace. It will drill holes, drive screws in or out, it can be used for tapping holes, and with socket bit will drive in small lag screws, run burrs, or nuts, on bolts, etc. Not only will it do this work rapidly, but, being straight, cylindrical and operated by pushing, it can reach in many places, in corners and in holes back of obstructions where a brace cannot be operated. The features of the push type of brace make it of special advantage in the quick and convenient action for car shops, for fitting up either wood or steel cars, bridge or structural templates, pattern makers, in garages for repairing work, and has been successfully used for grinding in valves in automobiles; and the outside mechanic who must have tools for all kinds of work, and needs to reduce the number carried to a minimum.

The automatic push drill is intended for boring holes in wood for various purposes, as setting screws, brads, nails, etc. It can be used in many places where a gimlet, brad awl or brace cannot be used and will bore in either soft or hard wood without splitting. The drill point is revolved by pushing down on the handle, a spring inside the tool forcing the handle up and ready to be pushed down again. As a single push causes several revolutions of the drill point, and the handle can be readily pushed down a couple of hundred times a minute, the drilling of the hole is done quickly. The revolutions resulting from pushing on the handle are secured by a mechanism similar to that on the spiral screw driver. The drill has a magazine in the handle, so that when opened, all the drill points are in plain sight, enabling the user to quickly select the proper size for the work in hand. The drill points are separated from each other by partitions in the magazine so that various sizes do not get mixed up. The magazine is quickly closed and locked, so there is little chance of losing any of the drill points.

The reciprocating drill is designed for use in drilling in steel, iron, brass and other metals, as well as all varieties of woods. It is so constructed that the drill runs continuously to the right, during both the forward and backward movement of the driver, hence drills continuously. The pressure to feed the drill is had by the pressure against the head of the tool, which is provided with ball bearing to reduce the friction.



A Vast Machine Shop Produces all the Cutting Tools Employed in the Plant

Breast and hand drills are designed for doing heavier work of the same character and in the same materials as the smaller push and reciprocal drills. They are preeminently machine-shop tools and usually require the use of both hands for their operation, but they have features which recommend them for use also in places outside of shops where a breast drill can be used. They are made with right and left hand, and continuous ratchet movements. A feature of this tool is that the mere movement of a shifter causes it to perform different movements. Placing the shifter in one notch makes the drill an ordinary or plain breast drill. In another notch, it becomes a left-hand ratchet, useful in removing taps, but especially to loosen the drill if it becomes jammed in a hole and cannot be moved forward or crank revolved backward. In a third notch, it becomes a right-hand ratchet. In the fourth notch, it becomes what is difficult to describe, but when seen excites admiration for what it does and curiosity as to how accomplished. When the shifter is in this notch, any movement of the crank, however short, or turned continuously in either direction or a combination of the two, the drill in the chuck will always turn to the right and drill continuously, hence no time is lost and double the work is done as compared with a single ratchet. This feature makes the drill especially convenient in corners, and out of the way places, where a crank cannot be turned. Another simple mechanical device makes it possible to change the speed of the tool while drilling, and without removing the tool from the work.

The purpose of the chain drill is to drill automatically, once the necessary adjustment is made a couple of turns of a brace tightening a chain which sets the drill at work and keeps it at work. This type of drill is convenient and rapid in operation, having an automatic friction and ratchet feed. The taking up and releasing of the chain is done by a movement with a friction feed by simply turning the brace or breast drill by which the chain drill is operated. When the chain is tight, the automatic feed operates by turning a small lever; when the drill has reached a desired depth the automatic feed is thrown off by turning the same small lever in another direction. The automatic feed is positive, fixed and without adjustment. There is no hand feed, nor are there any parts to fuss over, and there is nothing to catch or pinch the fingers in use.

This completes the description or rather definition of the more important types of time and labor-saving tools that are made in the works of North Brothers Manufacturing Company for drilling in wood and metal. Each one of these types is made in several varieties and in numerous sizes. While the same raw materials enter into each tool and the methods of working these materials up into the particular part of the finished tool they are to become, follow, broadly speaking, one general principle, it is obviously impossible in an article which is at best a brief survey, to follow the making of any one tool through the many operations. It is possible, however, to indicate just two or three of the stages in its journey, from inventor's brain to finished product, that stand out prominently.

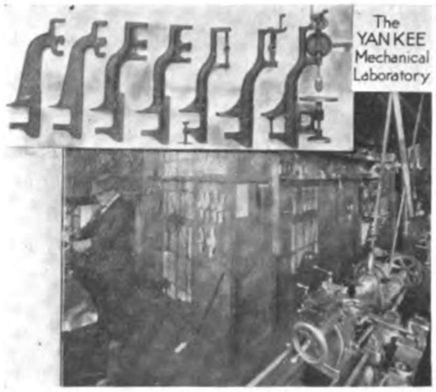
There is one department of the works which at first glance gives an impression of destructive work and wasted effort, but a little enlightenment by those in charge quickly changes this first impression and brings out the truly constructive character of the work being done. This department is what might be called, for want of a better name, the invention room. In this mechanical laboratory all the new tools have been hatched out at some time or another. The first step in this process—indeed, as has been suggested, it seems to be almost the chief function of the department—is to find fault with inventions, old or new, if it was possible to do so. The regular, every-day work of the inventor is to analyze the work a given tool has to do, to think up new tests which, he believes, will cover some fresh emergency of actual use to which any and every tool can be put. And if the inventor should discover, some time, an honest, legitimate strain that would mess up any single tool, he'd probably be more pleased than if he had invented something better and quicker than the tools which he believed to be well nigh perfect. In these tests all sorts of wrenches and all kinds of power are employed to get the tool apart and ruin it. But, since the tools are put together under a system that involves machinery capable of exerting a tremendous pressure, once a tool is together it requires an equally powerful force to pry it apart. To see the men in this invention room devoting creative genius to plan tests for destruction, and finding them almost continually futile, explains in part how tools can be made of such great strength combined with delicate accuracy.

The Final Inspection of Every Tool

Naturally, great quantities of machinery, very remarkable and expensive machinery, are found in every department, but the relative importance of this machinery is in a way dwarfed by the sure, precise and experienced knowledge of the individual workman. In the very home and heart of tool perfection, purely mechanical efficiency is relegated to second place, first place is held by the plain, old-fashioned skill of man.

In the whole sequence of production and assembling, at every stage, the tools are given an inspection that is far from being perfunctory. For example, there are long rows of experts who do nothing but test the screw-driver blades, who inflict torsions aad trials more severe than the tools could receive in the stress of actual work. There is another row of equally numerous and as indefatigable men who apply special machinery for the testing of drill points. After this eternal inspecting and testing every tool, blade and drill passes to another department, removed from the factory proper and immune to factory friendships, where the final inspectors do their work. Here every tool, now assembled as the perfect product of the plant, is put through its work in actual performance.

There is one very important part of the plant, a vast machine shop, which at first glance seems to have no connection with the rest of the plant, and as not responsible for any particular stage in the manufacture of the tools proper. This department does not touch the tools themselves, but its work has a most important place in the making of a perfect tool. For it is a department devoted exclusively to the production of the cutting tools which are employed in the rest of the plant for the manufacture of the tools themselves. In the same way other machines are engaged in making nothing but the screws that enter into the construction of the tools that go upon the market. So it is with every process tributary to the production of these specialties in tools.



The Work of Every Tool is Analyzed in the Invention Room

There is a factory story concerning the making of these Yankee screw-drivers, drills and similar tools that is closely related to the adage of the doctor taking his own medicine. The factory took the remedy first and then prescribed it for other tool users afterward. The story is this but before starting it should be mentioned that ice cream freezers are also made in the same factory, freezers that range in size and capacity from the small household utensil to the forty-quart machines that run by power.

To return to the story—A metal cup, to receive the pivot of the can, is screwed to the bottom of the pail of each freezer. To fasten this cup in the bottom of the can with the ordinary screw driver is an awkward screw-driving job, especially in the smaller sizes of freezer tubs, where there is little room for a man's hand. Such a slow process, performed day after day in a plant that was dedicated to lightning celerity, was a sheer contradiction. What was needed was some tool or other which would hold the blade of the driver in the screw head and enable the workman to drive the screw simply with the push of one hand, freeing him of the necessity of holding the driver blade with the other hand and bringing back the handle for the next push. No sooner was the need of such a tool observed than the invention room was put to work. The final result was the making of a springaction, spiral ratchet screw driver, and the tool was soon put to work, speeding up the production of ice cream freezers. For quite a while, to the mechanical eyes, one of the prettiest sights in the factory was the swift, sure, almost effortless work of the men who drove the screws home in the bottom of the freezer tubs. Soon after it was realized that here was a tool which was urgently needed for countless other awkward screw driving jobs the world over. This story of the birth of a quick return spiral ratchet screw driver may be duplicated in regard to other tools or of their parts.

An Awkward Screw Driving Job in the Plant was Responsible for a Better Tool